IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES
(Attorney Docket № 17474US02)

In the Application of:

Akira Yamanaka, et al.

Serial No. 10/773,804

Filed: February 6, 2004

For: METHOD AND SYSTEM FOR MEASURING IQ PATH MISMATCH

Examiner: Emmanuel Bayard

Group Art Unit: 2611

Confirmation No. 8463

Electronically filed on 27-JUN-2008

APPEAL BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from an Office Action dated January 7, 2008 ("Final Office Action"), in which claims 1-23 were finally rejected. The Applicant respectfully requests that the Board of Patent Appeals and Interferences ("Board") reverses the final rejection of claims 1-23 of the present application. The Applicant notes that this Appeal Brief is timely filed within the period for reply that ends on June 27, 2008.

REAL PARTY IN INTEREST
(37 C.F.R. § 41.37(c)(1)(i))

Broadcom Corporation, a corporation organized under the laws of the state of California, and having a place of business at 5300 California Avenue, Irvine, California 92617, has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as set forth in the Assignment recorded at Reel 018075, Frame 0976 in the PTO Assignment Search room.

RELATED APPEALS AND INTERFERENCES
(37 C.F.R. § 41.37(c)(1)(ii))

The Appellant is unaware of any related appeals or interferences.

STATUS OF THE CLAIMS
(37 C.F.R. § 41.37(c)(1)(iii))

Claims 1-23 were finally rejected. Pending claims 1-23 are the subject of this appeal.

The present application includes claims 1-23, which are pending in the present application. Claims 1-2, 5-8, 11-13, 18-19, and 22-23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 7,155,180, issued to Kim, et al. (hereinafter, Kim). *See* Final Office Action at page 2. Claims 3-4, 9-10, 14-17, and 20-

21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim, in view of U.S. Patent Application Publication No. 2004/0203472, issued to Chien (hereinafter, Chien). *See id.* at page 4. The Applicant identifies claims 1-23 as the claims that are being appealed. The text of the pending claims is provided in the Claims Appendix.

STATUS OF AMENDMENTS (37 C.F.R. § 41.37(c)(1)(iv))

The Applicant has not amended any claims subsequent to the final rejection of claims 1-23 mailed on January 7, 2008.

SUMMARY OF CLAIMED SUBJECT MATTER (37 C.F.R. § 41.37(c)(1)(v))

The invention of claim 1 is illustratively described in the Specification of the present application in, for example, pages 5-16. A method for measuring IQ path mismatch in transceivers may include estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path, and estimating a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source. *See* the present application, page 5, lines 2-5.

Claims 2-6 are dependent upon claim 1.

The invention of claim 7 is illustratively described in the Specification of the present application in, for example, pages 5-16. A system for estimation of IQ path

mismatch during signal modulation may include a transceiver (16, FIG. 1). The transceiver 16 may include a transmitter (32) and a receiver (30). The system may also include a processor (18) coupled to the transceiver (16). The processor (18) may identify a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path. The processor (18) may also identify a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source. *See id.* at FIGS. 1-3 and page 10, line 4 – page 11, line 19.

Claims 8-12 are dependent upon claim 7.

The invention of claim 13 is illustratively described in the Specification of the present application in, for example, pages 5-16. A method for estimating IQ path mismatch in a transceiver may include measuring a difference in the gain and phase response between transmitter I and Q paths and between receiver I and Q paths of a transceiver, the transmitter I and Q paths sharing a receiver path and the receiver I and Q paths sharing a signal source. The method may further include compensating for the difference of the transmitter and receiver I and Q paths using a digital FIR filter. *See id.* at FIGS. 1-3 and page 10, line 4 – page 11, line 19, and page 15, lines 7-22.

Claims 14-17 are dependent upon claim 13.

The invention of claim 18 is illustratively described in the Specification of the present application in, for example, pages 5-16. A system for estimation of IQ path mismatch during signal modulation may include a processor (18 in FIG. 1) operatively coupled to a transceiver (16) comprising a transmitter (32) and a receiver (30), the

processor identifying a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path, and identifying a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source. *See id.* at FIGS. 1-3 and page 10, line 4 – page 11, line 19, and page 15, lines 7-22.

Claims 19-23 are dependent upon claim 18.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL
(37 C.F.R. § 41.37(c)(1)(vi))

Claims 1-2, 5-8, 11-13, 18-19, and 22-23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 7,155,180, issued to Kim, et al. (hereinafter, Kim). Claims 3-4, 9-10, 14-17, and 20-21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim, in view of U.S. Patent Application Publication No. 2004/0203472, issued to Chien (hereinafter, Chien).

ARGUMENT
(37 C.F.R. § 41.37(c)(1)(vii))

In the Final Office Action, claims 1-2, 5-8, 11-13, 18-19, and 22-23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 7,155,180, issued to Kim, et al. (hereinafter, Kim). Claims 3-4, 9-10, 14-17, and 20-21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim, in view of U.S. Patent Application Publication No. 2004/0203472, issued to Chien (hereinafter, Chien).

I. Kim Does Not Anticipate Claims 1-2, 5-8, 11-13, 18-19, and 22-23

The Applicant first turns to the rejection of claims 1-2, 5-8, 11-13, 18-19, and 22-23 under 35 U.S.C. 102(e) as being anticipated by Kim. With regard to the anticipation rejections under 102, MPEP 2131 states that "[a] claim is anticipated only if **each and every element** as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." See Manual of Patent Examining Procedure (MPEP) at 2131 (internal citation omitted). Furthermore, "[t]he identical invention must be shown in as complete detail as is contained in the ... claim." See id. (internal citation omitted).

Without conceding that Kim qualifies as prior art under 35 U.S.C. 102(e), the Applicant respectfully traverses this rejection as follows.

A. Rejection of Independent Claims 1, 7, and 18 under 35 U.S.C. § 102(e)

With regard to the rejection of independent claim 1 under 102(e), the Applicant submits that Kim does not disclose or suggest at least the limitation of "estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path," as recited by the Applicant in independent claim 1.

The Examiner states the following in page 2 of the Final Office Action:

> "Kim et al teaches a method for measuring IQ path mismatch in transceivers, the method comprising: estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path (see fig.9 element TX and col.2, lines 59-67 and col.3, lines 35-40 and col.6, lines 9-35 and col.10,lines 35-59); and estimating a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source .(see fig.9 element RX and col.2, lines 59-67 and col.3, lines 35-40 and col.6, lines 9-35 and co1.10,lines 35-59)."

The Applicant points out that Kim does not teach any estimating of a transmitter IQ mismatch where the IQ signals are sampled from the transmitter IQ path. **The Examiner is referred to FIG. 9 of Kim where it is shown that transmitter Mismatch Estimation block receives its inputs from the receiver IQ output path and not from the transmitter IQ path.** Kim teaches down-converting an up-converted RF signal at the transmitter output, and generating IQ components from the down-converted signal for IQ phase gain mismatch compensation. *See* Kim at col. 10, lines 34-58 and FIG. 9.

The Applicant maintains that Kim does not disclose or suggest at least the limitation of "estimating a transmitter IQ mismatch in a form of gain and phase response

for transmitter I and Q paths sharing a receiver path," as recited by the Applicant in independent claim 1.

Accordingly, independent claim 1 is not anticipated by Kim and is allowable. Independent claims 7 and 18 are similar in many respects to the method disclosed in independent claim 1. Therefore, the Applicant submits that independent claims 7 and 18 are also allowable over the reference cited in the Office Action at least for the reasons stated above with regard to claim 1.

B. Reply to Final Office Action's Response to Arguments

The Final Office Action states the following:

> 1. Applicant's arguments filed 10/22/07 have been fully considered but they are not persuasive. In pages 9-11 of the response applicant argues that Kim does not teach "A method for measuring IQ path mismatch in transceivers, the method comprising: estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path; and estimating a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source" as recited in the Applicant's claim 1. Examiner respectfully disagrees.
>
> 2. Applicant relies on fig.3 of Kim to support his arguments. However, the Examiner's rejection is based on fig.9 of Kim which shows each and every element of the claimed limitations as set forth in the office action. Since applicant fails to address the rejection as regard to fig.9 of Kim, applicant's arguments are moot and this case is made final.

See Final Office Action at page 6. The Applicant respectfully disagrees and points out that Applicant's argument stated in pages 9-11 of the October 22, 2007 response is valid for both FIGS. 3 and 9 of Kim. For example, similarly to the mixer

circuit of FIG. 3, the mixer circuit of FIG. 9 also comprises an up conversion unit that constitutes a transmitter and a down conversion unit (designated as RECEIVER) for estimating mismatch generated in the up conversion unit by converting an output signal from the up conversion unit to a base-band output signal. Furthermore, **the mixer circuit of FIG. 9 performs mismatch compensation by making an output signal from the transmitter be inputted to the receiver, during mismatch compensation time.** *See* Kim, col. 10, lines 36-58. **As clearly seen from Kim's FIG. 9, the transmitter portion mismatch estimation (Mismatch Estimation Tx block) receives its inputs from the receiver portion and does not estimate transmitter IQ mismatch using gain and phase for the transmit I and Q paths, as recited in Applicant's claim 1.** The same principal of operation applies to the mixer circuit in Kim's FIG. 3 (as already explained in the October 22, 2007 response). In addition, the transmitter I and Q paths of Kim do not share a receiver path, as recited in Applicant's claim 1.

The Applicant maintains that Kim does not anticipate claims 1-2, 5-8, 11-13, 18-19, and 22-23.

C. Rejection of Dependent Claims 2, 8, and 19

Claims 2, 8, and 19 depend on independent claims 1, 7, and 18, respectively. Therefore, the Applicant submits that claims 2, 8, and 19 are allowable over the reference cited in the Final Office Action at least for the reasons stated above with

regard to claim 1. The Applicant also submits that Kim does not disclose or suggest at least the limitation of "wherein the estimating of a transmitter IQ mismatch and the estimating of a receiver IQ mismatch comprises measuring a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths," as recited by the Applicant in claims 2, 8, and 19.

With regard to claims 2, 8, and 19, the Final Office Action states the following at page 3:

> As per claims 2, 8 and 19 Kim et al teaches wherein estimating a transmitter IQ mismatch and estimating a receiver IQ mismatch further comprises measuring a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths (see fig.9 element and col.9, lines 40-45).

The Applicant points out that Kim, at col. 9, lines 40-45, discloses making the phase-difference between in-phase and quadrature-phase components of the local signal to be a predetermined value. However, Kim does not disclose any measuring of a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths for purposes of estimating a transmitter IQ mismatch and a receiver IQ mismatch.

Accordingly, the Applicant submits that claims 2, 8, and 19 are allowable over the reference cited in the Final Office Action at least for the above reasons. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 2, 8, and 19.

D. Rejection of Dependent Claims 5, 11, and 22

Claims 5, 11, and 22 depend on independent claims 1, 7, and 18, respectively. Therefore, the Applicant submits that claims 5, 11, and 22 are allowable over the reference cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Applicant also submits that Kim does not disclose or suggest at least the limitation of "comprising compensating for the difference of the transmitter and receiver I and Q paths using a digital FIR filter," as recited by the Applicant in claims 5, 11, and 22.

With regard to claims 5, 11, and 22, the Final Office Action states the following at page 3:

> As per claims 5, 11 and 22, Kim et al inherently teaches compensating for the difference of the transmitter and receiver I and Q paths using a digital FIR filter (see col. 10, lines 25-26).

The Applicant points out that Kim, at col. 10, lines 25-26, does not disclose that compensating for the difference of transmitter and receiver I and Q paths is achieved by using a digital FIR filter. Instead, the Examiner relies on inherency.

The Applicant submits that a rejection based on inherency must include a statement of the rationale or evidence tending to show inherency. *See* Manual of Patent Examining Procedure at § 2112. "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." *See id. citing In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

> To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. **Inherency, however, may not be established by probabilities or possibilities.** The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

The Applicant respectfully submits that neither Kim itself nor the Final Office Action "make[s] clear that the missing descriptive matter," said to be inherent "is necessarily present in" Kim.

A rejection based on inherency must be based on factual or technical reasoning:

> In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teaching of the applied prior art.

Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

The Applicant respectfully submits that the Final Office Action does not contain a basis in fact and/or technical reasoning to support the rejection based on inherency. Instead, as recited above, at least claims 5, 11, and 22 of the present application stand rejected based on a conclusory statement of inherency, rather than upon a "basis in fact and/or technical reasoning." Accordingly, the Applicant respectfully submits that, absent a "basis in fact and/or technical reasoning" for the rejection of record, that rejection should be reconsidered and withdrawn.

Accordingly, the Applicant submits that claims 5, 11, and 22 are allowable over the reference cited in the Final Office Action at least for the above reasons. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 5, 11, and 22.

E. Rejection of Dependent Claims 6, 12, and 23

Claims 6, 12, and 23 depend on independent claims 1, 7, and 18, respectively. Therefore, the Applicant submits that claims 6, 12, and 23 are allowable over the reference cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Applicant also submits that Kim does not disclose or suggest at least the limitation of "utilizing iterative estimation for filter tap parameters during the compensating," as recited by the Applicant in claims 6, 12, and 23.

With regard to claims 6, 12, and 23, the Final Office Action states the following at page 3:

> As per claims 6, 12 and 23, Kim et al inherently teaches utilizing iterative estimation for filter tap parameters during the compensating (see col. 10, lines 23-26).

The Applicant points out that Kim, at col. 10, lines 23-26, does not disclose that iterative estimation is used for any filter tap parameters during the compensating. Instead, the Examiner relies on inherency.

The Applicant submits that a rejection based on inherency must include a statement of the rationale or evidence tending to show inherency. *See* Manual of

Patent Examining Procedure at § 2112. "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." *See id. citing In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

> To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. **Inherency, however, may not be established by probabilities or possibilities.** The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). The Applicant respectfully submits that neither Kim itself nor the Final Office Action "make[s] clear that the missing descriptive matter," said to be inherent "is necessarily present in" Kim.

A rejection based on inherency must be based on factual or technical reasoning:

> In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teaching of the applied prior art.

Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

The Applicant respectfully submits that the Final Office Action does not contain a basis in fact and/or technical reasoning to support the rejection based on inherency.

Instead, as recited above, at least claims 6, 12, and 23 of the present application stand rejected based on a conclusory statement of inherency, rather than upon a "basis in fact and/or technical reasoning." Accordingly, the Applicant respectfully submits that, absent a "basis in fact and/or technical reasoning" for the rejection of record, that rejection should be reconsidered and withdrawn.

Accordingly, the Applicant submits that claims 6, 12, and 23 are allowable over the reference cited in the Final Office Action at least for the above reasons. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 6, 12, and 23.

F. Rejection of Independent Claim 13

With regard to the rejection of independent claim 13 under 35 U.S.C. § 102(e), the Applicant submits that Kim does not disclose or suggest at least the limitation of "measuring a difference in the gain and phase response between transmitter I and Q paths and between receiver I and Q paths of a transceiver, the transmitter I and Q paths sharing a receiver path and the receiver I and Q paths sharing a signal source," as recited by the Applicant in claim 13.

With regard to claim 13, the Final Office Action states the following at page 3:

> As per claim 13, Kim et al teaches method for estimating IQ path mismatch in a transceiver, the method comprising: measuring a difference in the gain and phase response between transmitter I and Q paths and between receiver I and Q paths of a transceiver (see fig.9 and col.9, lines 40-48) the transmitter I and Q paths sharing a receiver path and the

receiver I and Q paths sharing a signal source (see figs. 6 and 7 and page 2 [0015, 0017 and 0022]);

The Applicant points out that Kim, at col. 9, lines 40-48, discloses making the phase-difference between in-phase and quadrature-phase components of the local signal to be a predetermined value. However, Kim does not disclose any measuring of a difference in the gain and phase response between transmitter I and Q paths and between receiver I and Q paths of a transceiver. In addition, neither FIG. 6 nor FIG. 7 of Kim (and even any of the supporting specification of Kim) discloses that the transmitter I and Q paths share a receiver path, and the receiver I and Q paths share a signal source, as recited in Applicant's claim 13.

Accordingly, the Applicant submits that claim 13 is allowable over the reference cited in the Final Office Action at least for the above reasons. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claim 13.

II. The Proposed Combination of Kim and Chien Does Not Render Claims 3-4, 9-10, 14-17, and 20-21 Unpatentable

Based on at least the foregoing, the Applicant believes the rejection of independent claims 1, 7, 13, and 18 under 35 U.S.C. § 102(e) as being anticipated by Kim has been overcome and requests that the rejection be withdrawn. Additionally, since the additional cited reference (Chien) does not overcome the deficiencies of Kim, claims 3-4, 9-10, 14-17, and 20-21 depend from independent claims 1, 7, 13, and 18,

respectively, and are, consequently, also respectfully submitted to be allowable at least for the reasons stated above with regard to allowability of claim 1. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 3-4, 9-10, 14-17, and 20-21.

A. Rejection of Dependent Claims 3 and 9

Claims 3 and 9 depend on independent claims 1 and 7, respectively. Therefore, the Applicant submits that claims 3 and 9 are allowable over the references cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Applicant also submits that the combination of Kim and Chien does not disclose or suggest at least the limitation of "wherein the measuring comprises sending a tone signal and measuring a power and phase shift for all of desired frequency points," as recited by the Applicant in claims 3 and 9.

With regard to claims 3 and 9, the Final Office Action states the following at page 4:

> As per claims 3 and 9, Kim et al teaches all the features of the claimed invention except wherein measuring further comprises sending a tone signal and measuring a power and phase shift for all of desired frequency points.
>
> Chein [sic] teaches wherein measuring further comprises sending a tone signal (see page 6 [0097], and page 9 [0118]) and measuring a power (see [0110] and phase shift for all of desired frequency points (see page 18 [00234-0235]).
>
> It would have been obvious to one of ordinary skill in the art to implement the teaching of Chein [sic] into Kim as to perform the magnitude square

> operation which would be used to estimate intermediate values required to compute the transmitter imbalance as taught by Chein [sic] (see [0235]).

The Applicant points out that the tone signal disclosed by Chien in ¶ 0097 is a local calibration signal used by the transceiver. *See* Chien at ¶ 0085. Therefore, the tone calibration signal in Chien is not used for purposes of measuring any difference in the gain and phase responses of the transmitter and receiver I and Q paths. Similarly, Kim, at ¶¶ 0110 and 0234-0235, does not disclose any measuring of a power and phase shift for desired frequency points for purposes of measuring any difference in the gain and phase responses of the transmitter and receiver I and Q paths, as recited in Applicant's claim 3.

Accordingly, the Applicant submits that claims 3 and 9 are allowable over the references cited in the Final Office Action at least for the above reasons. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 3 and 9.

B. Rejection of Dependent Claims 4 and 10

Claims 4 and 10 depend on independent claims 1 and 7, respectively. Therefore, the Applicant submits that claims 4 and 10 are allowable over the references cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Applicant also submits that the combination of Kim and Chien does not disclose or suggest at least the limitation of "wherein the measuring comprises sending uniformly

spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone," as recited by the Applicant in claims 4 and 10.

With regard to claims 4 and 10, the Final Office Action states the following at pages 4-5:

> As per claims 4 and 10, Kim et al teaches all the features of the claimed invention except measuring further comprises sending uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone.
>
> Chein [sic] teaches wherein measuring further comprises sending uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone (see page 9 [0018-0119] and page 24 [0319]).
>
> It would have be obvious to one of ordinary skill in the art to implement the teaching of Chein [sic] into Kim as to perform the magnitude square operation which would be used to estimate intermediate values required to compute the transmitter imbalance as taught by Chein [sic] (see [0235]).

The Applicant points out that Kim, at ¶¶ 0118-0119 and 0319, does not disclose any sending of uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone. In fact, Chien does not even disclose the use of any multi-tone white signals.

Accordingly, the Applicant submits that claims 4 and 10 are allowable over the references cited in the Final Office Action at least for the above reasons. The Applicant

also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 4 and 10.

C. Rejection of Dependent Claims 14-15 and 20-21

Claims 14-15 and 20-21 depend on independent claims 13 and 18, respectively. Therefore, the Applicant submits that claims 14-15 and 20-21 are allowable over the references cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Applicant also submits that the combination of Kim and Chien does not disclose or suggest at least the limitation of "wherein the measuring comprises sending a tone signal and measuring a power and phase shift for all of desired frequency points," as recited by the Applicant in claims 14-15 and 20-21.

With regard to claims 14-15 and 20-21, the Final Office Action states the following at page 5:

> As per claims 14-15 and 20-21, Kim et al teaches all the features of the claimed invention except wherein measuring further comprises sending a tone signal and measuring a power and phase shift for all of desired frequency points.
>
> Chein [sic] teaches wherein measuring further comprises sending a tone signal (see page 6 [0097], and page 9 [0118]) and measuring a power (see [0110] and phase shift for all of desired frequency points (see page 18 [00234-0235]).
>
> It would have been obvious to one of ordinary skill in the art to implement the teaching of Chein [sic] into Kim as to perform the magnitude square operation which would be used to estimate intermediate values required to compute the transmitter imbalance as taught by Chein [sic] (see [0235]).

The Applicant points out that the tone signal disclosed by Chien in ¶ 0097 is a local calibration signal used by the transceiver. *See* Chien at ¶ 0085. Therefore, the tone calibration signal in Chien is not used for purposes of measuring any difference in the gain and phase responses of the transmitter and receiver I and Q paths. Similarly, Kim, at ¶¶ 0110 and 0234-0235, does not disclose any measuring of a power and phase shift for desired frequency points for purposes of measuring any difference in the gain and phase responses of the transmitter and receiver I and Q paths, as recited in Applicant's claim 14.

Accordingly, the Applicant submits that claims 14-15 and 20-21 are allowable over the references cited in the Final Office Action at least for the above reasons. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 14-15 and 20-21.

D. Rejection of Dependent Claim 16

Claim 16 depends on independent claim 13. Therefore, the Applicant submits that claim 16 is allowable over the references cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Applicant also submits that the combination of Kim and Chien does not disclose or suggest at least the limitation of "wherein the compensating comprises utilizing iterative estimation for filter tap parameters," as recited by the Applicant in claim 16.

With regard to claim 16, the Final Office Action states the following at page 5:

> As per claim 16, Kim et al inherently teaches utilizing iterative estimation for filter tap parameters during the compensating (see col. 10, lines 23-26).

The Applicant would like to point out that Kim, at col. 10, lines 23-26, does not disclose the use of iterative estimation for filter tap parameters. Instead, the Examiner relies on inherency.

The Applicant submits that a rejection based on inherency must include a statement of the rationale or evidence tending to show inherency. *See* Manual of Patent Examining Procedure at § 2112. "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." *See id. citing In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

> To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. **Inherency, however, may not be established by probabilities or possibilities.** The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). The Applicant respectfully submits that neither Chien itself nor the Final Office Action "make[s] clear that the missing descriptive matter," said to be inherent "is necessarily present in" Kim.

A rejection based on inherency must be based on factual or technical reasoning:

> In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teaching of the applied prior art.

Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

The Applicant respectfully submits that the Final Office Action does not contain a basis in fact and/or technical reasoning to support the rejection based on inherency. Instead, as recited above, at least claim 16 of the present application stands rejected based on a conclusory statement of inherency, rather than upon a "basis in fact and/or technical reasoning." Accordingly, the Applicant respectfully submits that, absent a "basis in fact and/or technical reasoning" for the rejection of record, that rejection should be reconsidered and withdrawn.

Accordingly, the Applicant submits that claim 16 is allowable over the references cited in the Final Office Action at least for the above reasons. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claim 16.

E. Rejection of Dependent Claim 17

Claim 17 depends on independent claim 13. Therefore, the Applicant submits that claim 17 is allowable over the references cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Applicant also submits that the combination of Kim and Chien does not disclose or suggest at least the limitation of

"performing the measuring and compensating for spectrum efficient modulation," as recited by the Applicant in claim 17.

> With regard to claim 17, the Final Office Action states the following at page 5:
>
> As per claim 17, Kim and Chein [sic] in combination would teach comprising performing the measuring and compensating for spectrum efficient modulation o [sic] perform the magnitude square operation which would be used to estimate intermediate values required to compute the transmitter imbalance as taught by Chein [sic] (see [0235]).

Paragraph 0235 of Chien discloses the following:

> According to an embodiment employed with the architecture shown in FIG. 33, four test signals are introduced into a preamble that allows the transmitter to perform the estimation via the power detector 3308, which effectively performs the magnitude squared operation to generate Iw(t)I2 used to estimate the intermediate values w, x, y, and z required to compute the transmitter imbalance. FIG. 34 shows a flowchart illustrating an exemplary embodiment of this process. According to embodiments of the present invention, an additional test signal with the baseband signals set to I=Q=O is required to estimate the DC offset in the transmitted signal, as shown at S3402. At S3404, the value w is computed and stored. The I-Q symbols are then set to A and zero, respectively at S3406. I w m is then computed at S3408. At S3410, the offset is then cancelled and the result is stored in y. The I-Q symbols are then set to zero and A, respectively at S3412. I w m is then computed at S3414. At S3416, the offset is then cancelled and the result is stored in x. The I-Q symbols are then both set to A at S3418. I w m is then computed at S3420. At S3422, the offset is then cancelled and the result is stored in z.

In this regard, ¶ 0235 of Chien does not disclose that any measuring and compensating are being performed for purposes of spectrum efficient modulation, as recited in Applicant's claim 17. Accordingly, the Applicant submits that claim 17 is allowable over the references cited in the Final Office Action at least for the above reasons. The

Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claim 17.

CONCLUSION

For at least the foregoing reasons, the Applicant submits that claims 1-23 are in condition for allowance. Reversal of the Examiner's rejection and issuance of a patent on the application are therefore requested.

The Commissioner is hereby authorized to charge $510 (to cover the Brief on Appeal Fee) and any additional fees or credit any overpayment to the deposit account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

Respectfully submitted,

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(OIB)

CLAIMS APPENDIX
(37 C.F.R. § 41.37(c)(1)(viii))

1. A method for measuring IQ path mismatch in transceivers, the method comprising:

estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path; and

estimating a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source.

2. The method of claim 1, wherein the estimating of a transmitter IQ mismatch and the estimating of a receiver IQ mismatch comprises measuring a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths.

3. The method of claim 2, wherein the measuring comprises sending a tone signal and measuring a power and phase shift for all of desired frequency points.

4. The method of claim 3, wherein the measuring comprises sending uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone.

5. The method of claim 2, comprising compensating for the difference of the transmitter and receiver I and Q paths using a digital FIR filter.

6. The method of claim 5, comprising utilizing iterative estimation for filter tap parameters during the compensating.

7. A system for estimation of IQ path mismatch during signal modulation, the system comprising

a transceiver, the transceiver comprising a transmitter and a receiver; and

a processor coupled to the transceiver, the processor identifying a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path, and identifying a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source.

8. The system of claim 7, wherein the processor identifies a transmitter IQ mismatch and identifies a receiver IQ mismatch by measuring a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths.

9. The system of claim 8, wherein the processor sends a tone signal and measures a power and phase shift for all of desired frequency points.

10. The system of claim 9, wherein the processor sends uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone.

11. The system of claim 8, comprising a digital FIR filter coupled to the transmitter and receiver paths that compensates for the difference of the transmitter and receiver I and Q paths.

12. The system of claim 11, wherein the processor utilizes iterative estimation for filter tap parameters during the compensating.

13. A method for estimating IQ path mismatch in a transceiver, the method comprising:

measuring a difference in the gain and phase response between transmitter I and Q paths and between receiver I and Q paths of a transceiver, the transmitter I and Q paths sharing a receiver path and the receiver I and Q paths sharing a signal source; and

compensating for the difference of the transmitter and receiver I and Q paths using a digital FIR filter.

14. The method of claim 13, wherein the measuring comprises sending a tone signal and measuring a power and phase shift for all of desired frequency points.

15. The method of claim 14, wherein the measuring comprises sending uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone.

16. The method of claim 15, wherein the compensating comprises utilizing iterative estimation for filter tap parameters.

17. The method of claim 16, comprising performing the measuring and compensating for spectrum efficient modulation.

18. A system for estimation of IQ path mismatch during signal modulation, the system comprising

a processor operatively coupled to a transceiver comprising a transmitter and a receiver, the processor identifying a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path, and identifying a receiver IQ mismatch in a form of gain and phase response for receiver I and Q paths sharing a signal source.

19. The system of claim 18, wherein the processor identifies a transmitter IQ mismatch and identifies a receiver IQ mismatch by measuring a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths.

20. The system of claim 19, wherein the processor sends a tone signal and measures a power and phase shift for all of desired frequency points.

21. The system of claim 20, wherein the processor sends uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone.

22. The system of claim 19, comprising a digital FIR filter coupled to the transmitter and receiver paths that compensates for the difference of the transmitter and receiver I and Q paths.

23. The system of claim 22, wherein the processor utilizes iterative estimation for filter tap parameters during the compensating.

EVIDENCE APPENDIX
(37 C.F.R. § 41.37(c)(1)(ix))

(1) United States Patent No. 7,155,180 ("Kim"), entered into record by the Examiner in the August 2, 2007 Office Action.

(2) United States Patent Publication No. 2004/0203472 ("Chien"), entered into record by the Examiner in the March 6, 2007 Office Action.

RELATED PROCEEDINGS APPENDIX
(37 C.F.R. § 41.37(c)(1)(x))

The Appellant is unaware of any related appeals or interferences.